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Taylor rule for the conduct of monetary policy objectives in the case of Algeria
قاعدة تايلور لتحقيق أهداف السياسة النقدية دراسة حالة الجزائر

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Abstract

ملخص

The goal of this study is to determine the optimal Taylor rule within inflation gap and GDP Gap under Inflation Targeting in the case of Algeria through an empirical analysis using a GMM (Generalized Method of Moments) upon quarterly data for the period 2003-2017. Results show that the impact of money market rate has a negligible effect on inflation and economic activity. Main Findings and results of this paper argue that the implantation an implicit inflation targeting framework using Taylor rule have become more suitable to conduct and improving monetary policy performance.

Keywords :Inflation targeting, monetary policy, Taylor rule, Generalized Method of Moments (GMM).
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تستهدف هذه الدراسة تحديد قاعدة تايلور لاستهداف التضخم في الجزائر باستخدام منهجية العزوم المعممة خلال الفترة 2003–2017 للتوصل الدراسة أن سعر الفائدة له اثر هامشي على التضخم وان استهداف الضمني للتضخم يكون أكثر نفع لبلوغ أهداف السياسة النقدية في الجزائر

الملخص استهداف التضخم، سياسة نقدية، منهجية عزوم معممة.

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1. INTRODUCTION

Algeria's government including the monetary authority aims to ensure price stability and to promote economic growth. Despite the increase in inflation in the first quarter 2017 at 4% versus 5.8% a year earlier, the inflation rate is more than the target ratio of 4% set recently adopted from the Council of Money and Credit.

Over the previous year and before reported actually inflation by "the Office National des Statistiques (ONS)", the inflation rate was it a bed for the Algerian economy and the people purchasing power were inflation rate has been growing rapidly since the 1990s. Average CPI inflation was 18.55% in the first decade of estimation study (1990s). On the Contrary in the second decade (2000s), inflation had witnessed their lowest average at 3.2 %. After the end the first decade of the new millennium and beginning of the second decade, inflation was characterized by increasing the inflation rates in levels to 6-8.5 percent. Five years ago today, stability price benefited from a better rate compared with two last decades when there was a decrease in inflation rate about average of 5%. Economic growth as second objective has become the crucial challenge for recent economy performance in Algeria while sources Oil and gas incomes have been dominant structure of the Algerian economy. This sector accounted for 97% of exports between "2002 – 2014", 29 to 46 percent of GDP and 46 to 75 percent of government revenue and trade openness is higher more than 60% in same period.

The goal of this study is to determine the optimal Taylor rule within inflation and GDP Gaps under Inflation Targeting in the case of Algeria through an empirical analysis using a GMM Model (Vector Autoregressive Model) upon quarterly data for the period 2003-2017.

The rest of the paper is organized as follows. In section 2 we present Review Literature. Section 3 presents Model and Methodology. Section 4 shows results and discussion. Section 5 contains the main conclusion

2. Review Literature

(Taylor, 1993) developed his famous formula of inflation targeting. It was addressed to provide how much the Federal Reserve should change a short-term interest rate in response to movements of inflation gap and output gap.

(Richard, 1998) used GMM in six countries namely Germany, Japan, USA, UK, France and Italy for estimating monetary policy reaction introduced to Taylor's Rule in these countries. They found that the first tree countries have

pursued an implicit from inflation targeting over two decades 1980s and 1990s. C .G.G authors concluded that rest three countries heavily influenced by Germany monetary policy when they found difficult to build credibility trough an Exchange Rate Mechanism (ERM) under the European Monetary System *(*EMS*)*. (Richar, Jordi, & Mark, 2000)assessed empirical implication of inflation forecast targeting in many international evidence and emerging countries used GMM and sometimes SVAR.

(Edward, 2004) carried out a similar analysis of Taylor (1993) and his found coefficients on inflation gaps and output gap are 1.3 and 0.5 during the period 1992 -1997 in UK.

(Kyongwook, 2003) pointed the efficiency of inflation targeting framework to justify the economic performance of a monetary policy using Markov switching model in the New Zealand country. (Frederic, 2003) Identified five characteristics before making inflation targeting work in emerging market.

(Ismail, Lee, Rodríguez, & Lutz, 2007) examined a set of countries which adopted inflation targeting by applying the ARMA and GARCH methods. Results of this estimation suggested that no statistical evidence to use inflation targeting, which indicated a no impact of IT on the economic performance of a monetary policy while the actual inflation levels have had lower than the forecasted ones.

(Ftiti, 2010) checked the performance of a monetary policy and in particular the implementation of inflation targeting policy and found that a long-run equilibrium associate exist between inflation with interest rate and with GDP growth that implies to reduce uncertainty into the monetary environment

In Asia–Pacific, newest study of (Stefan & Tillmann, 2012) found that persistence tends to decline following Asian central banks adopted inflation targeting policy after the Asian financial crisis in 1997–1998when Korea introduced inflation targeting in 1998, Indonesia and Thailand in 2000, and the Philippines in 2002**.**

(Jaromír, Miroslav, & Vašíček, 2015) investigated what extent the success of inflation targeting in on three Central European (CE) countries (the Czech Republic, Hungary, and Poland) that adopted the IT regime using Bayesian model. They result show that inflation targeting does not itself automatically lead to the reduction of inflation and changes in microeconomic behavior.

(Nana, Imhotep, & Eric l, 2020) demonstrated that inflation targeting lowered inflation persistence in Ghana and the level of inflation was not affected by inflation targeting strategy.

3. Model and Methodology

Data source

The sample comprised 60 quarterly observations for the period 2003 - 2017. The sources of our variables representing by money market rate and inflation rate, Gross domestic product *(GDP)* are collected from Bank of Algeria and International financial Statistics. We use technique of the Hodrick–Prescott filter to derive the potential output. Real effective exchange rate (REER) is the same weighted averages of bilateral exchange rates adjusted by relative consumer prices and it selected from The Bank for International Settlements.

Econometric approach

For checking monetary policy reaction by Taylor rule we use Generalized Method of Moments (GMM) proposed by (Hansen & Kenneth J, 1982). Many study applied this method for estimating how much the central bank should change the nominal interest rate to conduct of monetary policy. Generalized method of moments (GMM) can help avoid serial correlation among variables which use the least square method (GLS)

Specifying the Taylor Rule Applications in the Case of Algeria

Firstly, we present (Taylor, 1993)

$$i_t = \pi_t + r_t^* + a_\pi(\pi_t - \pi_t^*) + a_y(y_t - \bar{y}_t). \text{ ..... (1)}$$

Where: i_t is the target short-term nominal interest, π_t is the rate of inflation, π_t^* is the desired rate of inflation, r_t^* is real interest rate, y_t is the logarithm of real GDP, and $\bar{y}_t$ is the logarithm of potential output, as determined by a linear trend. (Taylor, 1993) found that a_π =1.5 and a_y=0.15, so, a_π and $a_y > 0$.

At the beginning of the 1990s, some countries adopted inflation targeting using Taylor rule, with the primary objective was to keep inflation low and stable growth. Today, many central banks announced inflation targets, than those which are reported in Table 1 and shows a different rate for monetary policy.

Table 1: inflation targets for central banks

Country	Target of inflation	Interest Rate	Country	Target of inflation	Interest Rate
Albania	3 +/-1	2	Mexico	3 +/-1	3
Armenia	4+/-1,5	11	Moldavia	5 +/-1,5	14
Australia	2 - 3	0	Mongolia	7	13
Azerbaijan	5,00 - 6,00	4	Mozambique	6	8
Bangladesh	7	7	New Zeeland	2 +/-1	4
Belarus	12	25	Nigeria	6 - 9	13
Botswana	3 - 6		Norway	3	1
Brazil	4,5+/-2	13	Pakistan	8	8
Canada	2 +/-1	1	Peru	2 +/-1	3
Chile	3 +/-1	3	Philippines	3 +/- 1	4
China	4		Poland	2,5 +/-1	2
Colombia	3+/-1	5	Romania	2,5 +/-1	2
Czech Republic	2 +/-1	0	Russia	4,5 1)	14
Dominican	4+/-1	6	Samoa	3	-
Euro Area	<2	0	Serbia	4 +/-1,5	7
Georgia	6	5	South Africa	3- 6	6
Ghana	8,00 +/- 2,0	21	South Korea	2,5 - 3,5	2
Hungary	3 +/-1	2	Sri Lanka	3 - 5	6
Iceland	3	5	Sweden	2	0
India	8 3)	8	Switzerland	<2	1
Indonesia	4+/-1	8	Thailand	2,5 +/-1,5	2
Israel	1 - 3	0	Turkey	5+/-1,5	8
Japan	2	-	Uganda	5	12
Kenya ENYA	5 +/-2	9	Ukraine	29	30
Kyrgyzstan	7	11	UK	2	1
Malawi	15/12 4)	25	Uruguay	3 - 7	-
Mongolia	7	13	USA	2	0
Mozambique	6	8	Vietnam	7	7

			West African		
Zambia	7	13	States	2 +/-1	4

Sources: central Bank News web.

Notes : 1) +/- 1.5 pct point uncertainty band, 2) '15 target, 5.0% '18-'20, 3) 6.00% by Jan 2016, 4% for 2016/17 fin year, 4) June, December targets

Table 1 clarifies a strong association between the inflation and interest rates in sixty countries and signaling small inflation rate follows by a small interest rate and vice versa witch the interest rate was more than inflation rate except some developed economies namely Australia, Israel, Japan and Euro Area and Azerbaijan as small economy.

In the Algerian case

Many previous studies specified Taylor rule equation conferment their countries estimating that we going to robust for The Algerian case.

$I_t = r^* + \pi^* + \alpha (\pi - 2) + \beta (y_t - y^*) + reer_{t} + I_{t-1} + \varepsilon t$**…………… (2)**

Where:

i_t is the money market rate

π is the rate of inflation

y: the GDP of billion US Dollar

π^* and y^* are the target of inflation and GDP . We called these variables on based the Hodrick–Prescott decomposition that we can be solved as:

$$\min_{\tau} \left(\sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \left[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}) \right]^2 \right).$$

r^*: real interest rate

reer: Reel effective exchange rate

I_{t-1}: lagged money market rate

α and β are parameters of Taylor rule estimated

In this context, the figure below compares between interest rate and inflation rate in Algerian were money market rate is lower than inflation rate at all time. Also, we observe week association among three monetary variables with the interest rate was decreased to 15%, the inflation rate increase about 10%. We noted for example the decrease inflation rate in 2005 accompanied by increase interest rate; In addition, during period covert 2007 from 2017 interest rate stabilize relatively to 3% -5.4% except one year of 2012. On the contrary, inflation rate has been a huge volatility in

the same period.

Figure 1: Monetary policy instruments evolution
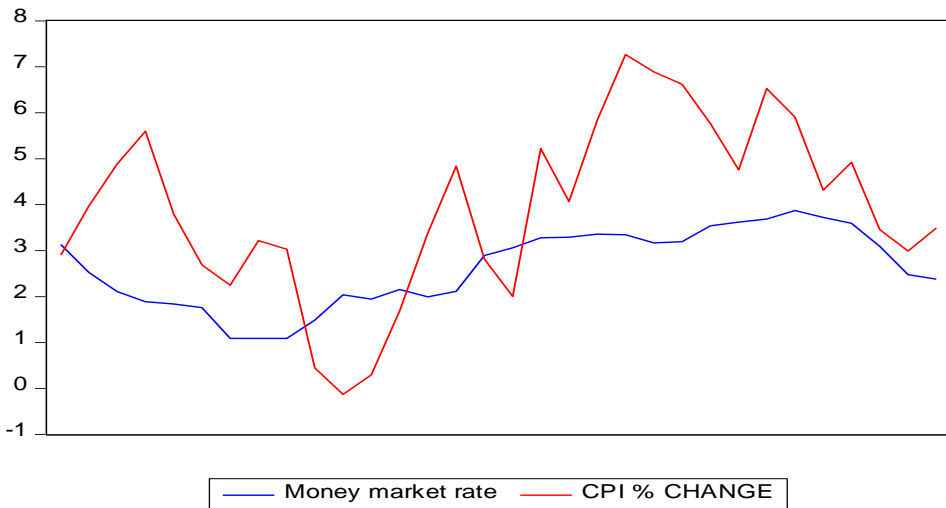
The targeting of money supply and low level of inflation has become major strategy of monetary authority in Algeria when this level of inflation considered being 3 %. This not clear commitment in our country cannot help to discipline monetary policy to control prices level pressures then the current debate around the world economy turn to how an explicit target inflation rate to achieve the optimal inflation and output gaps. Of course, this new strategy don't mean the seeming exclusion completely the older policy rules of monetarism, especially, in the case while the deterioration of manufacturing sector and Algerians Dutch disease are not allows the monetary instruments to achieve of their aims particularly in the mid and long run. But, table number 2 shows the detailed independence between money supply and inflation rate When would an increase in the money supply, inflation should be increased by same percent of money supply growth (See more (Frederic, 2003)**).** the increase in money supply of 180% was increase in inflation rate of 59% during the period from 2003 to 2017. This contradictory situation remains the main issue to be dealt with in this paper. Addition to that, if inflation targeting were to be exercised as useful objective can be helps to stabilize the expectation of future inflation, the bank of Algeria should be more independent from political decision makers and must to be taken into consideration reduce vulnerability of capital flows and need to avoid corruption, weak taxation system.

4. Results and comment

Econometric diagnostic test present the exits of serial correlation when we use the least square method (GLS), as results we shall be employing the GMM. Table bellow reports the results of parameters in forwad-looking monetary policy rules inspiring to (Richard, 1998)**.**

Our results of Durbin Watson seems to be good with high R^2 more than 80 percent that that meaning the change of money market rate can explains by percent from 80%. This high importance percentage change of the model can be confirms by J-statistic (0.16) which allow us to determine whether the instrumental variables are significant affected at the 10% level to dependent and regressors variables.

Furthermore, parameters of Taylor rule estimating in the Algerian case are statistically significant and relatively near to zero. Structural parameter of inflation gap (α) and output gap (β) are 0.05 and 0.01 respectively and that can be reveal the negligible effect of these coefficients values on money market rate and neutrally of interest rate in the Algerian monetary policy with no association of all composites Taylor rule equation. Here and according to the previous results of Taylor and Svensson, monetary policy inflation would have failed to found a nominal interest rate anchor. The bank of Algeria money market rate cannot be to conduct inflation stabilization, while its help to guide inflation from 7% in the first end estimation years to increase 130% by the end of the first quarter 2017 at 5.3% note that inflation rate in 2000 was not exceeded to 0.5%. In contrast, money market rate was never move accordance inflation rate movements. This unimportant can be shown that the monetary policy behave was elated from inflation rates because the weakness of bank system on the first hand. On other hand, the close relationship between inflation and money market rate explained by the decomposition core inflation and its uncertainty. Thus it is necessary to adopt the adjustment request and smooth change necessary of monetary policy to more control strict of inflation. However, the implicit inflation target has week sign of output gap because the main reason of this reaction can be explains by dominate of hydrocarbon incomes of the Algerian economy structure and the ineffective of monetary policies to including economy growth in their objectives and divergence between real economy and monetary policy. Also, we note reel effective exchange rate coefficient is relatively very low and negative sign, where reflects whether the Algerian exchange rate has not account an implicit inflation

targeting rule despite the upward trend in imports especially Fast-food consumption. If the important reaction of exchange rate to inflation by increasing of base money causes by depreciation of puzzling role of the exchange rate policy in Algeria, lower exchange rate reaction to policy rate instrument reflect other puzzling role of official interest rate consist the absence and independence between monetary policy instruments.

Table 3: Taylor-type reaction functions for inflation targeting economies with GMM

Inflation gap (α)	0,05*
output gap(β)	0,01*
Real effective Exchange rate	-0,06*
Lagged MMR	0,88*
R2	0,81
J-statistic	0,16
Number of instruements	12

In the next step, we shall be calculating the money market rate using the estimated structural parameters of table 4 comparing with the official money market rate adopted by central bank during the period covers 2003 and 2017. The main finding of this comparison show that targeted Inflation rate is 4.66, then Inflation rate and money market rate in same period are 4.66 and 2.344 respectively. As such, this evidence is clearly concluded that Taylor's rule simulation was more useful than administrative interest rate (MMR) adopted over the last decade by bank of Algeria and not a suitable yet of inflation targeting helps explain how the Algerian policymaker chooses wrong strategy to serve successful inflation and impractical of actually commitment clarifies the puzzling role of monetary policy in Algeria.

Table 4: comparison among MMR, MMR calculated, inflation rate during the period 2003 to 2017

money market rate calculated	money market rate	Inflation rate
4,93460917	2,68819425	4,40193358

5. Conclusion

The goal of this study is to focus on inflation targeting in Algeria. Based on results of GMM (Generalized Method of Moments) upon quarterly data for the period 2003-2017, we found the main reason of unsuccessfully high inflation levels is neutrality the policy rate and incredibility of the monetary authorities to treat it. Consequently, the main results of this research paper argue to an implicit inflation targeting framework as efficient strategy to conduct of monetary policy objectives in the case of Algeria when monetary aggregate and exchange rate strategies cannot to be guidelines an implicit inflation targeting rule during the period of the study

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